Exercises from lecture 4 (Swarm robotics 1) TEK5010 Multiagent systems 2020

Question 1

In this exercise we are going to look at how we could quantize swarm performance. The Universal Scalability Law (USL) [Gunther, 1993] is often used in this case.

a) In terms of using USL for modelling the performance of swarm systems, could you explain the model?

b) Could you describe some typical performance profiles of the swarm system for varying USL parameters? In each case make a plot spanning at least N=200 processes.

c) Given the parameters $C = 0.25$, $\alpha = -0.0335$, $\beta = 0.00032$ and unlimited number of robots available, what would be the optimal performance in this case? Would optimality change if we have a limited number of robots available and expect a constant loss of robots per robot?